

What is claimed is:

1 1. A method of forming capacitor dielectric structure,
2 comprising steps of:

3 providing a semiconductor substrate having at least a
4 predetermined capacitor structure;

5 using silicon nitride deposition to form a SiN layer on
6 the predetermined capacitor structure;

7 using a reoxidation process to grow an oxide layer on the
8 SiN layer; and

9 using a nitridation process to form a nitridation layer
10 on the oxide layer.

1 2. The method according to claim 1, wherein the capacitor
2 dielectric structure is applied to a deep trench capacitor.

1 3. The method according to claim 2, wherein the
2 predetermined capacitor structure is a deep trench formed
3 within the semiconductor substrate.

1 4. The method according to claim 3, wherein the SiN layer
2 is formed on the sidewall and bottom of the deep trench.

1 5. The method according to claim 1, wherein the capacitor
2 dielectric structure is applied to a stacked-type capacitor.

1 6. The method according to claim 1, further comprising a
2 step of pre-cleaning the semiconductor substrate before the
3 step of using silicon nitride deposition.

1 7. The method according to claim 1, wherein the silicon
2 nitride deposition is at a temperature more than 700°C.

1 8. The method according to claim 1, wherein the
2 nitridation process uses nitrogen-containing gases.

1 9. The method according to claim 8, wherein the
2 nitrogen-containing gas is NH₃.

1 10. The method according to claim 1, wherein the
2 nitridation process is performed more than 30 minutes.

1 11. A method of forming capacitor dielectric structure,
2 comprising steps of:

3 providing a semiconductor substrate having at least a deep
4 trench;

5 using silicon nitride deposition to form a SiN layer on
6 the sidewall and bottom of the deep trench;

7 using a reoxidation process to grow an oxide layer on the
8 SiN layer; and

9 using a nitridation process to form a nitridation layer
10 on the oxide layer.

1 12. The method according to claim 11, wherein the silicon
2 nitride deposition is at a temperature higher than 700°C.

1 13. The method according to claim 11, wherein the
2 nitridation process uses nitrogen-containing gases.

1 14. The method according to claim 13, wherein the

2 nitrogen-containing gas is NH_3 .

1 15. The method according to claim 11, wherein the
2 nitridation process is performed more than 30 minutes.

1 16. A capacitor dielectric structure, comprising:
2 a semiconductor substrate having at least a predetermined
3 capacitor structure;
4 a SiN layer formed on the predetermined capacitor
5 structure;
6 an oxide layer grown on the SiN layer; and
7 a nitridation layer formed on the oxide layer.

1 17. The capacitor dielectric structure according to claim
2 16, wherein the capacitor dielectric structure is applied to
3 a deep trench capacitor.

1 18. The capacitor dielectric structure according to claim
2 17, wherein the predetermined capacitor structure is a deep
3 trench formed within the semiconductor substrate.

1 19. The capacitor dielectric structure according to claim
2 18, wherein the SiN layer is formed on the sidewall and bottom
3 of the deep trench.

1 20. The capacitor dielectric structure according to claim
2 16, wherein the capacitor dielectric structure is applied to
3 a stacked-type capacitor.